

# Status of Gateway Power and Propulsion Element (PPE)

National Aeronautics and  
Space Administration



## NASA ADVISORY COUNCIL

### Human Exploration and Operations Committee

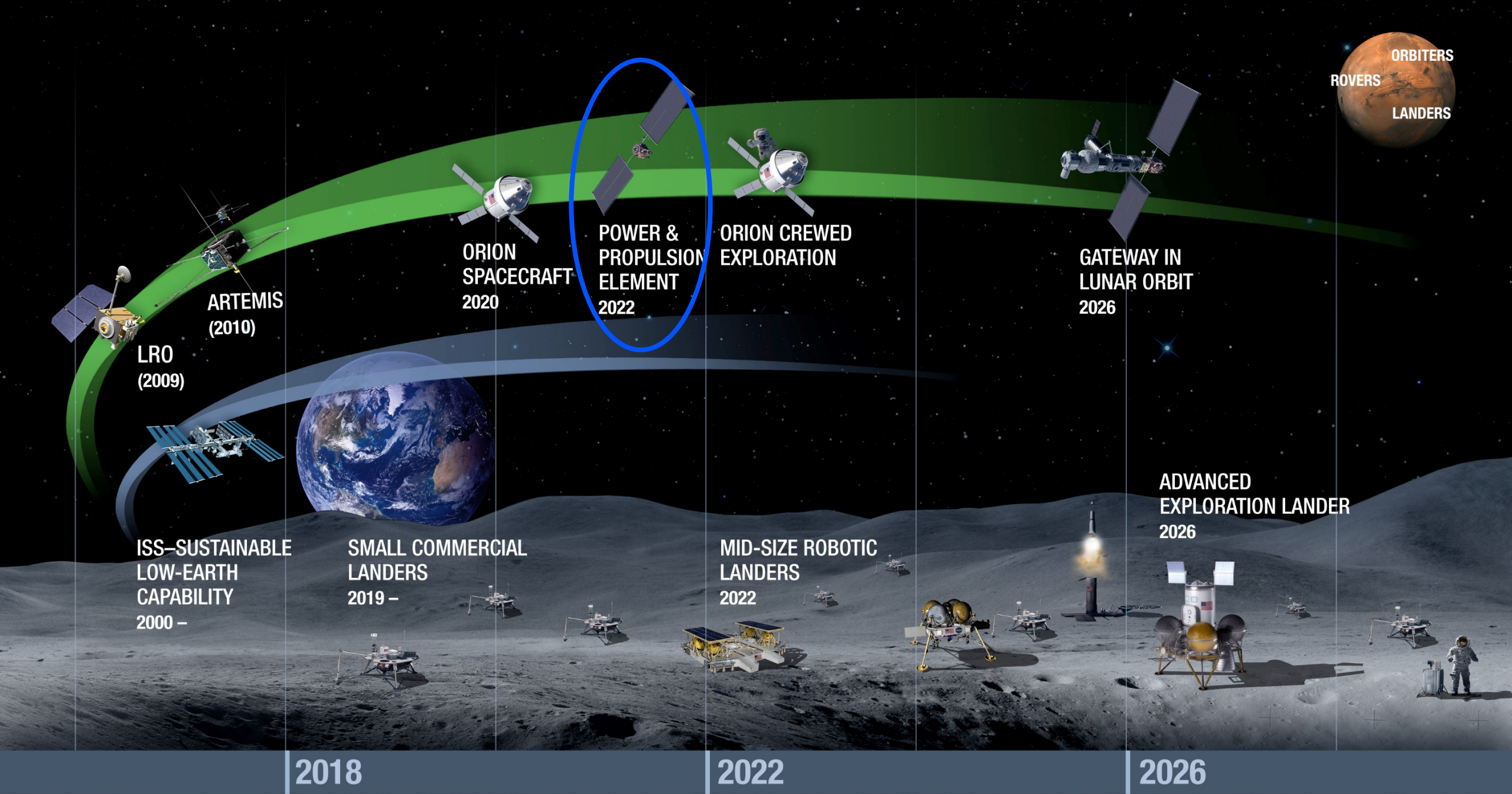
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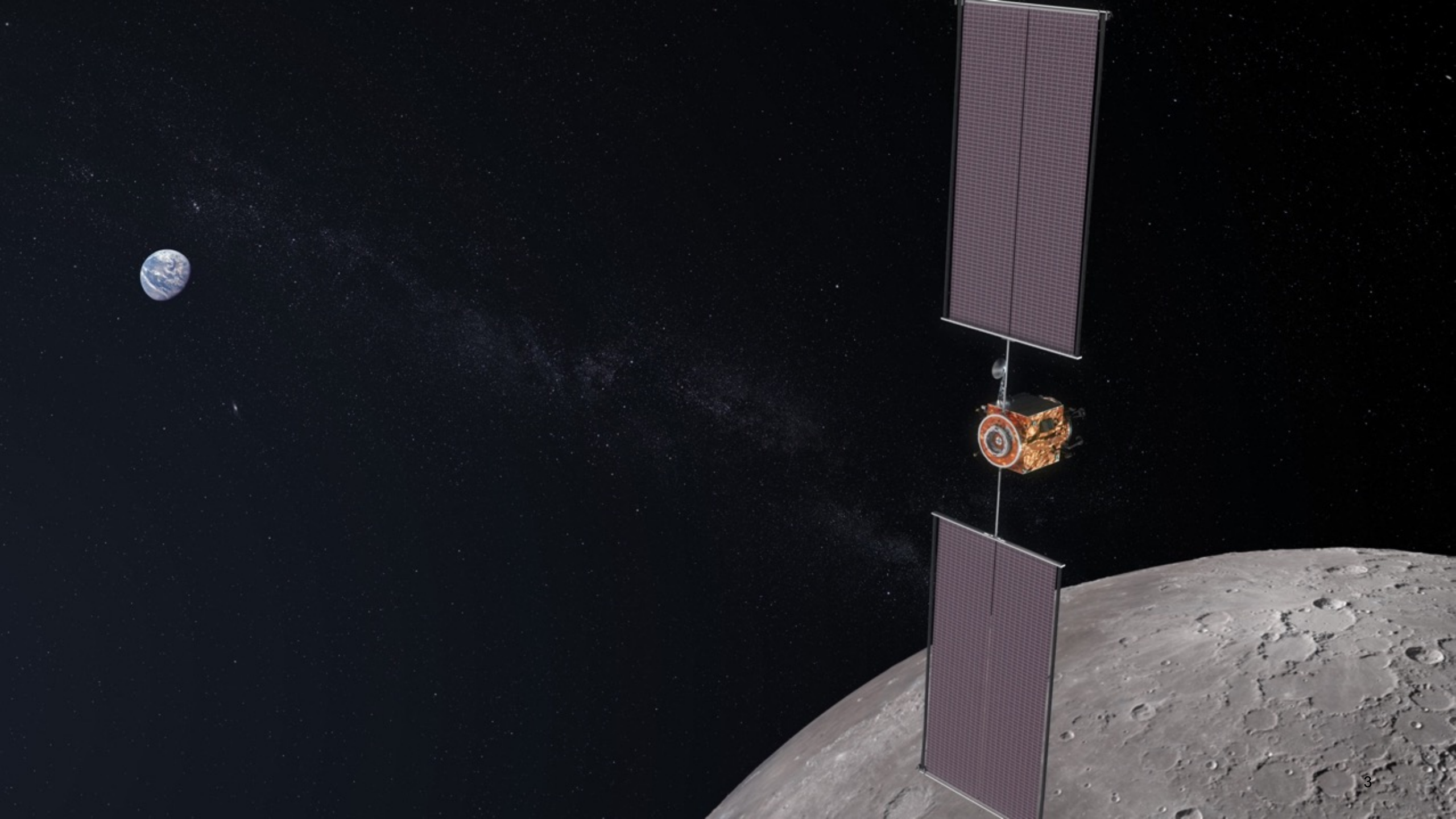
**07 December 2018**



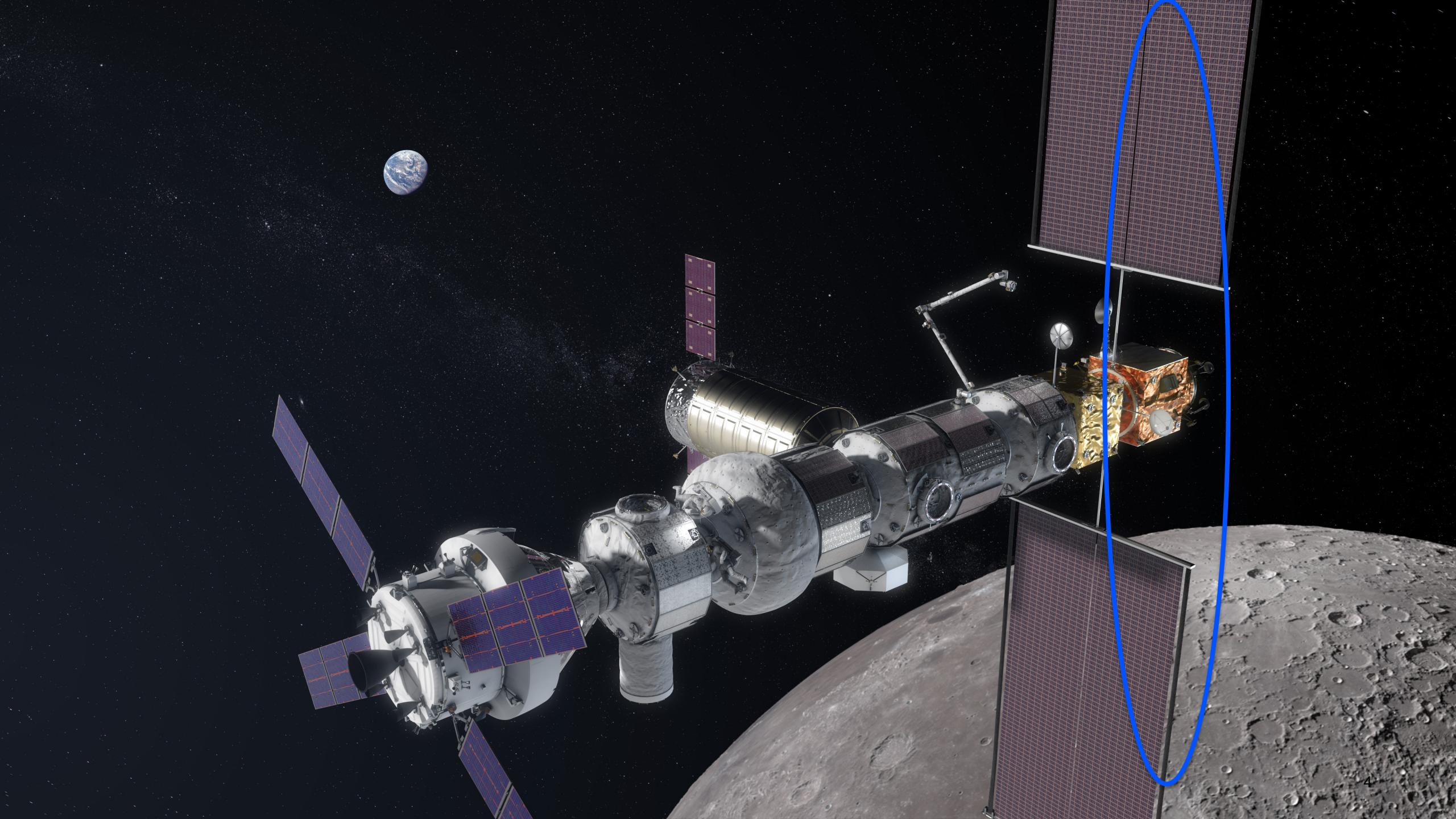










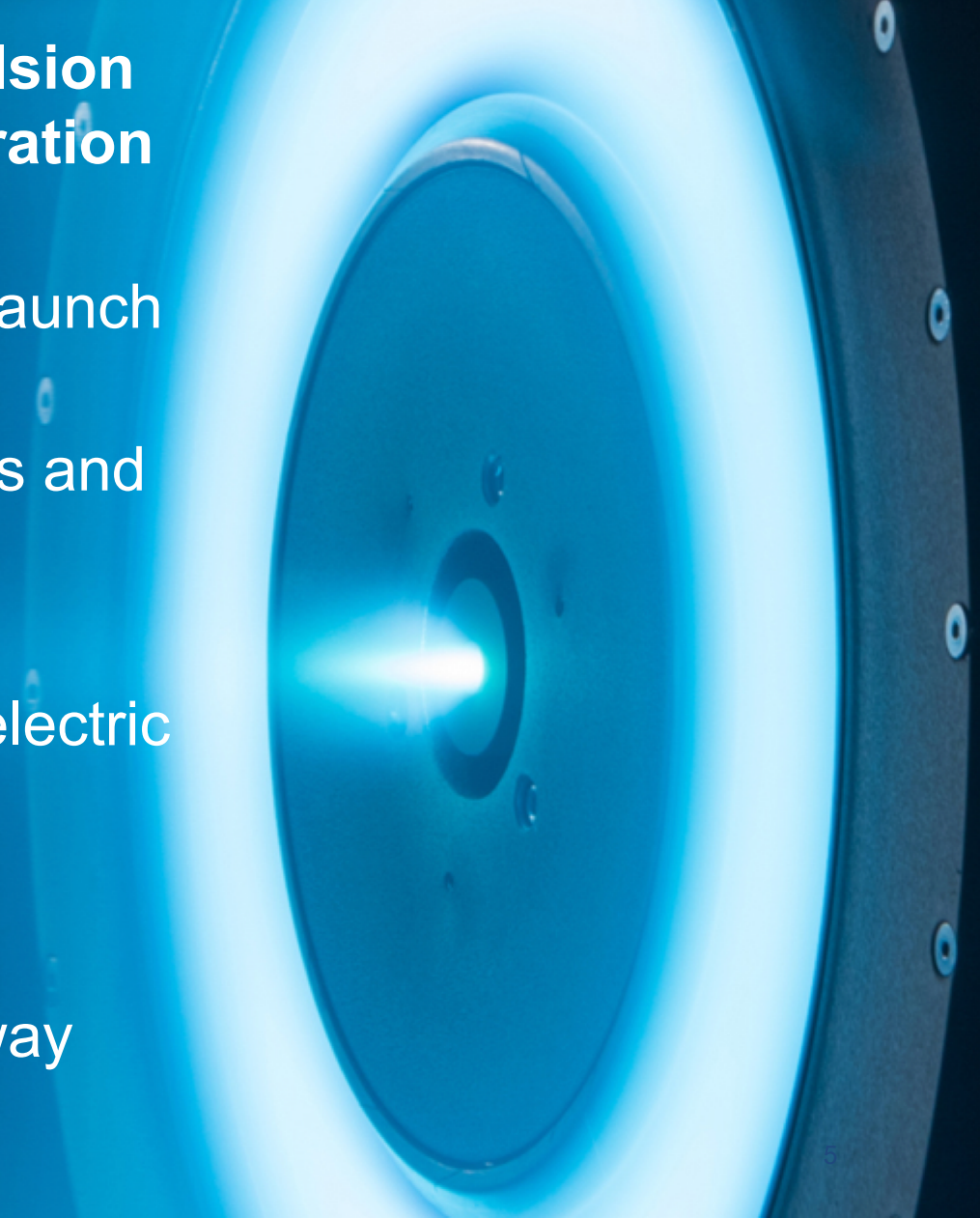




# Approach to Power and Propulsion Element Development



- **PPE leverages advanced solar electric propulsion (SEP) technology development and demonstration formulation:**
  - First Gateway element capability targeted for launch readiness in 2022
  - Leverage with U.S. industry current capabilities and future plans for future use of SEP
  - Developed through public-private partnership
  - Spaceflight demonstration of advanced solar electric propulsion spacecraft for industry and NASA objectives
  - Also provides for communications, and transportation, controls, power to future Gateway elements





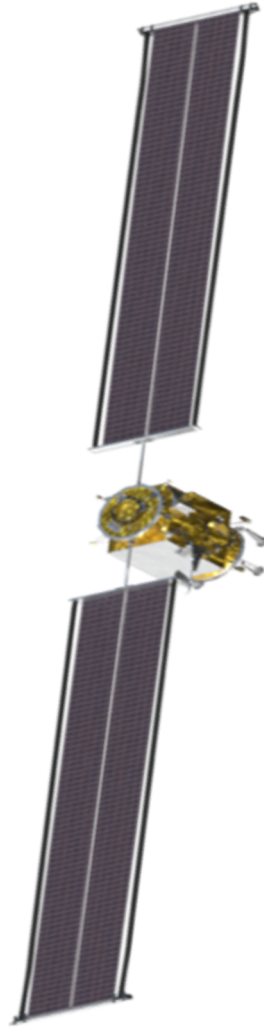
- Broad Agency Announcement for PPE [released](#); proposals were due on November 15 (note, we are in blackout)
- Followed RFI, studies with 5 companies solicited through BAA, sources sought, draft solicitation release & industry comment. Worked very closely with industry throughout to address their written comments and questions.
- PPE development and demonstration through research and development partnership with industry
- Partner will own PPE through up to 1 year spaceflight demonstration
- Includes contract option to acquire residual asset (PPE) for NASA use, after demonstration completion
- More than one industry partner may be selected.
- NASA and its PPE partner(s) will begin upon contract award, which is targeted for March 2019 (TBD).
- Launch date September 2022, followed by demonstration up to one year
- Partnership concludes 24 months after successful spaceflight demonstration if all options are executed.



# PPE NASA-Unique Spaceflight Demonstration Objectives



- Demonstrate high-power, 50kW-class solar array and electric propulsion technology in relevant space environments
- Demonstrate continuous long-term electric propulsion operation sufficient to predict the xenon throughput capability and lifetime of high power systems
- Demonstrate the deployment and successful long-term, deep-space operation of high power solar array systems with applicability to future higher power missions
- Characterize in space operation of a next generation electric propulsion string
- Demonstrate integrated SEP end-to-end system performance in relevant space environments
- Observe and characterize performance of integral high-power SEP system including thrusters, arrays, bus, and payloads as they operate as an integrated system and as they respond to the natural and induced in-space environments
- Demonstrate extended autonomous high-power SEP operations in deep space
- Demonstrate a high data throughput uplink and downlink communication system
- Demonstrate PPE insertion into a crew-accessible Near Rectilinear Halo Orbit (NRHO)
- Obtain design, development, and flight demonstration data to determine acceptability of the PPE for the Gateway





# Gateway Milestones: PPE Highlights



- ✓ September 6: PPE Final Solicitation Released
- ✓ September 9: Schedule Technical Interchange Meeting (TIM) with International Partners
- ✓ September 10-14: Formulation Sync Review (FSR) Kickoff
- ✓ October 2 – 5: International Habitat Technical Interchange Meeting (TIM) @ ESTEC
- ✓ October 4: FSR Requests for Action due
- ✓ October: European Space Agency/European System Providing Refueling Infrastructure and Telecommunications (ESPRIT) Virtual TIM
- ✓ October 23: Logistics Services Sources Sought Notice Issued
- ✓ December 17: Habitation Element and Logistics Element Procurement Strategy Meetings

## Looking Ahead

- Gateway program transition from formulation to center program management
- PPE Selection(s) – March 2019
- Science/Utilization Workshop – Spring 2019
- Gateway U.S. Logistics and U.S. Habitation solicitations – Spring/Summer 2019



# Recent examples of PPE efforts supporting Gateway



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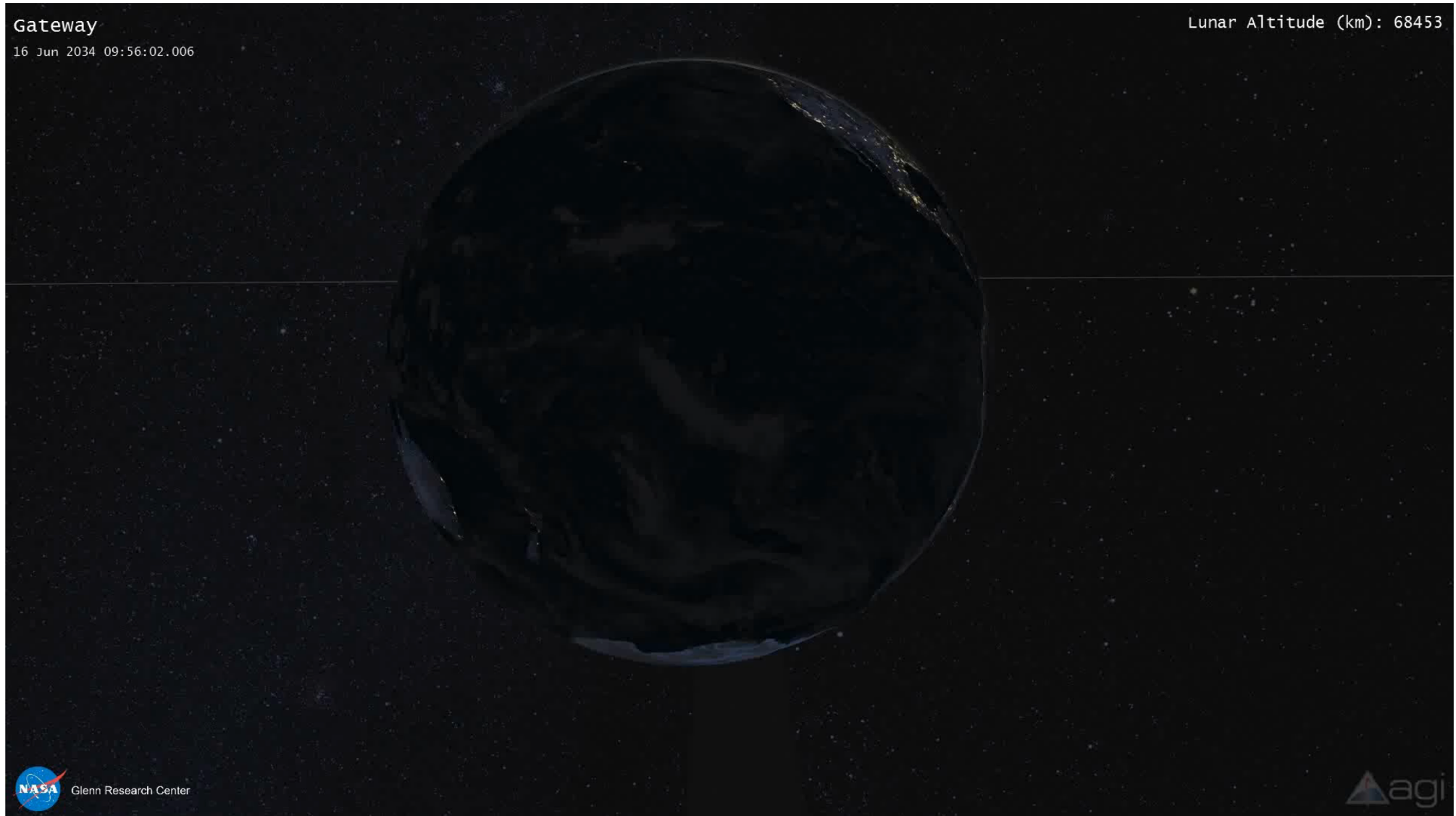
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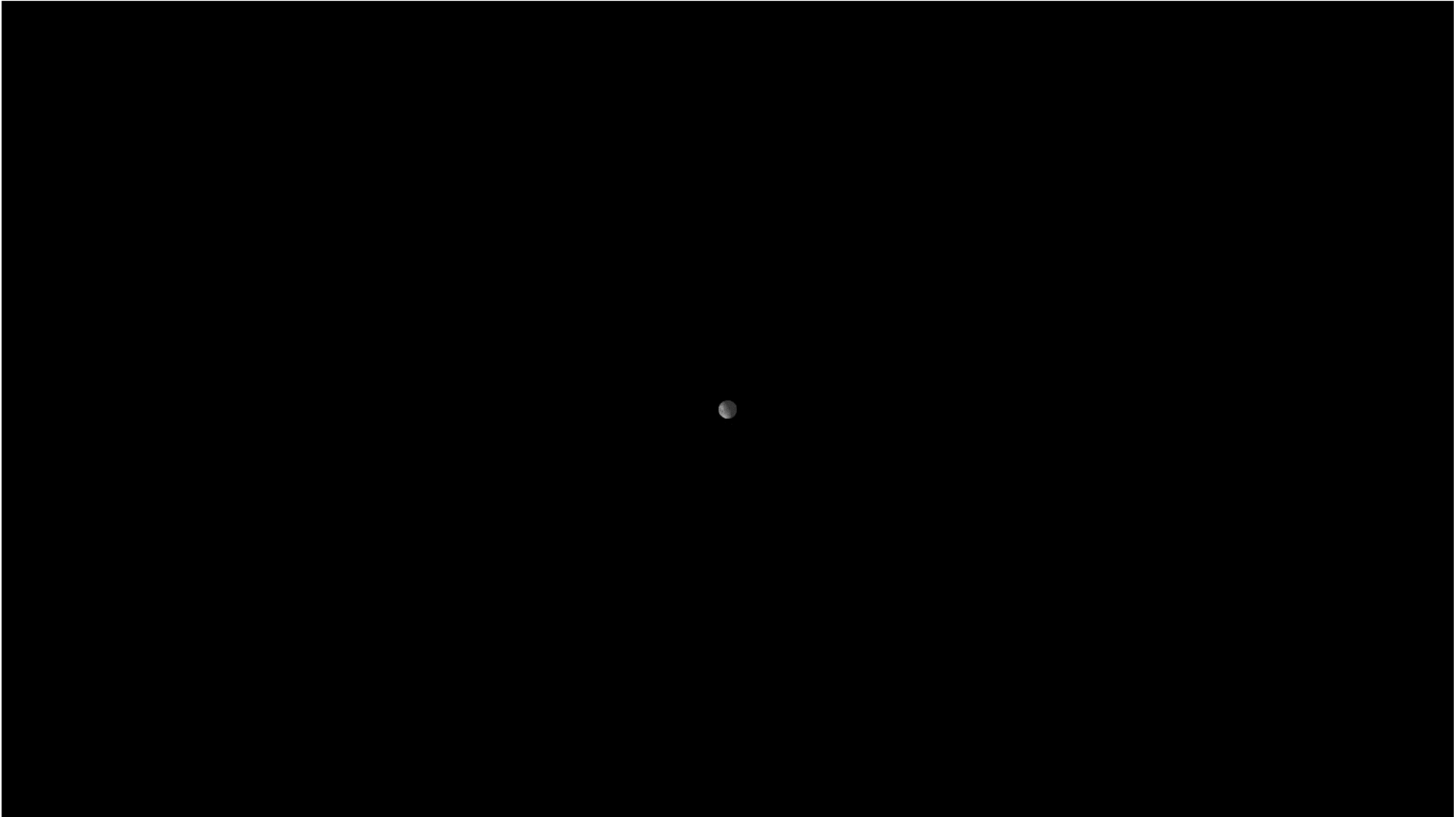
## EXAMPLES:

- PPE presented initial refueling concept of operations analysis results at the TIM with Gateway and European Space Agency/European System Providing Refueling Infrastructure and Telecommunications (ESPRIT)
- PPE is supporting Gateway FSR activities and closure plans
- PPE supported NASA Docking System (NDS) Block 2 System Requirements Review (SRR)



# Gateway in the Near Rectilinear Halo Orbit (NRHO)







# PPE Milestones & Events the Past Quarter



✓ Final BAA released for Spaceflight Demonstration of a PPE	Sept 6, 2018
✓ PPE participation in ISS/Gateway schedule Technical Interchange Meeting (TIM) with international partners	Sept 9, 2018
✓ Gateway Formulation Sync Review (FSR) Kickoff	Sept 10-14, 2018
✓ AIAA Space Forum panel participation*	Sept 18, 2018
✓ International Astronautical Congress 2018 PPE status presentation*	Oct 1, 2018
✓ PPE participation in Gateway/ESPRIT/PPE Virtual TIM with international partners	Oct 16, 2018
✓ PPE Leadership Retreat, Plum Brook Station	Oct 24-25, 2018
✓ Proposals to Final PPE Solicitation due	Nov 15, 2018
✓ NASA Day on the Hill*	December 4, 2018
• PPE partnership contract selection(s)	March 2019 (TBD)
• IEEE Aerospace Conference PPE studies presentation*	March 2-9, 2019

*\*External events*

